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Imaging Under Extreme Conditions

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CALIFORNIA INSTITUTE OF TECHNOLOGY

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Final Report

Air Force Research Laboratory
AF Office Of Scientific Research (AFOSR)/ RTE
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14. ABSTRACT
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From: Professor Ahmed Zewail, Caltech

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Contract/Grant #: FA9550-11-1-0055
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Annual Accomplishments:

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A number of variant techniques of 4D Ultrafast Electron Microscopy (UEM) imaging have been reported including 4D tomography, sub-particle imaging, electron energy-loss spectroscopy, and photon-induced near-field microscopy, the PINEM effect. Publications of research at Caltech were reported in *Science, Nature, JACS, JPC, ChemPhysChem, PNAS, Nano Lett.,* and *Angewandte Chemie*.

The applications of 4D UEM (and diffraction) are numerous, and we have successfully reported, using direct imaging, the atomic-scale of molecular nanocrystals, the phase transition in metal-insulator transitions, the embryonic crystallization following extreme melting, the discovery of nanogating in quasi-1D materials, and the nature of interface electric fields for free nanoparticles and nanoparticles on surfaces. We also reported on the theoretical foundation for the phenomena, and research continues in these new directions. Recent highlights are published as overviews and reviews in Science (Review), Accounts of Chemical Research (Review), Scientific American, and in a book.

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6) A. H. Zewail, “4D Visualization of Matter,” Imperial College Press, London (2014).

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Professor Ahmed H. Zewail

Program Manager
The AFOSR Program Manager currently assigned to the award

Dr. Michael Berman

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05/15/2011

Reporting Period End Date

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Abstract

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Changes in research objectives (if any):

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Change in AFOSR Program Manager, if any:

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Reporting Period

Laboratory Task Manager

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Research Objectives

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